

Low power drive · Mini package

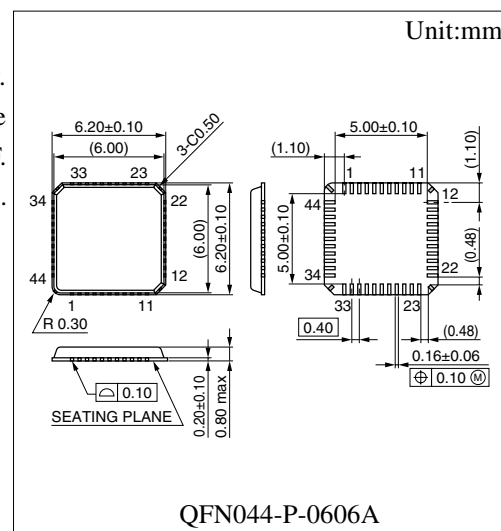
Audio Interface IC AN12906A

Overview

The AN12906A is an input/output interface IC that has built-in audio capability. This IC integrates in a single chip configuration a speaker amplifier, headphone amplifier, microphone amplifier, AGC, microphone voltage supply and LPF. Power supply voltage for Speaker-drive can drive low-voltage of 1.8 voltage. AN12906A has the power-save function for each amplifier's.

Features

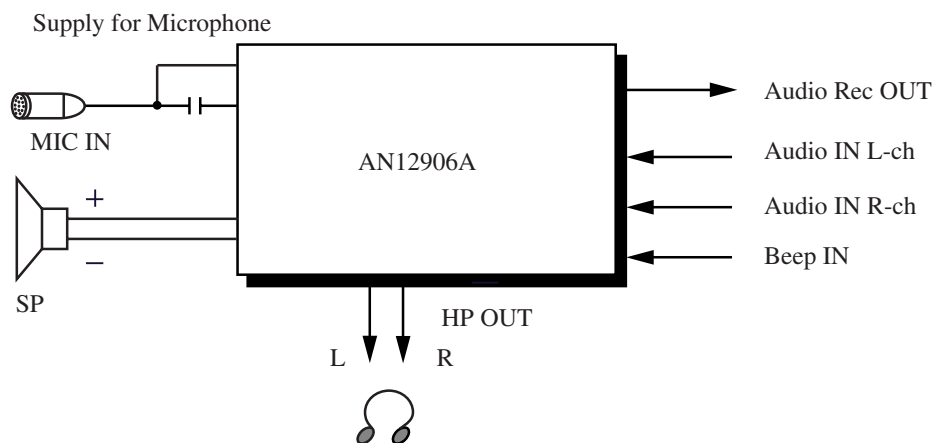
- Built-in Amplifier's.
Speaker/BTL (mono), Headphone (stereo), Microphone (mono), LPF
- Built-in Power-save function.
Speaker-Amp., Headphone-Amp., Microphone-Amp., All-Standby
- Beep-input, Input-Gain change High & Low, Mute, AGC ON/OFF
- Power supply voltage : $V_{CC} = 2.7 \text{ V}$ to 4.2 V , $V_{CC_SP} = 1.8 \text{ V}$ to 4.2 V
- Speaker absolute maximum rating : 270 mW (typ)
- Package : QFN44-pin



Applications

- IC-Recorder, PDA, DSC, etc.

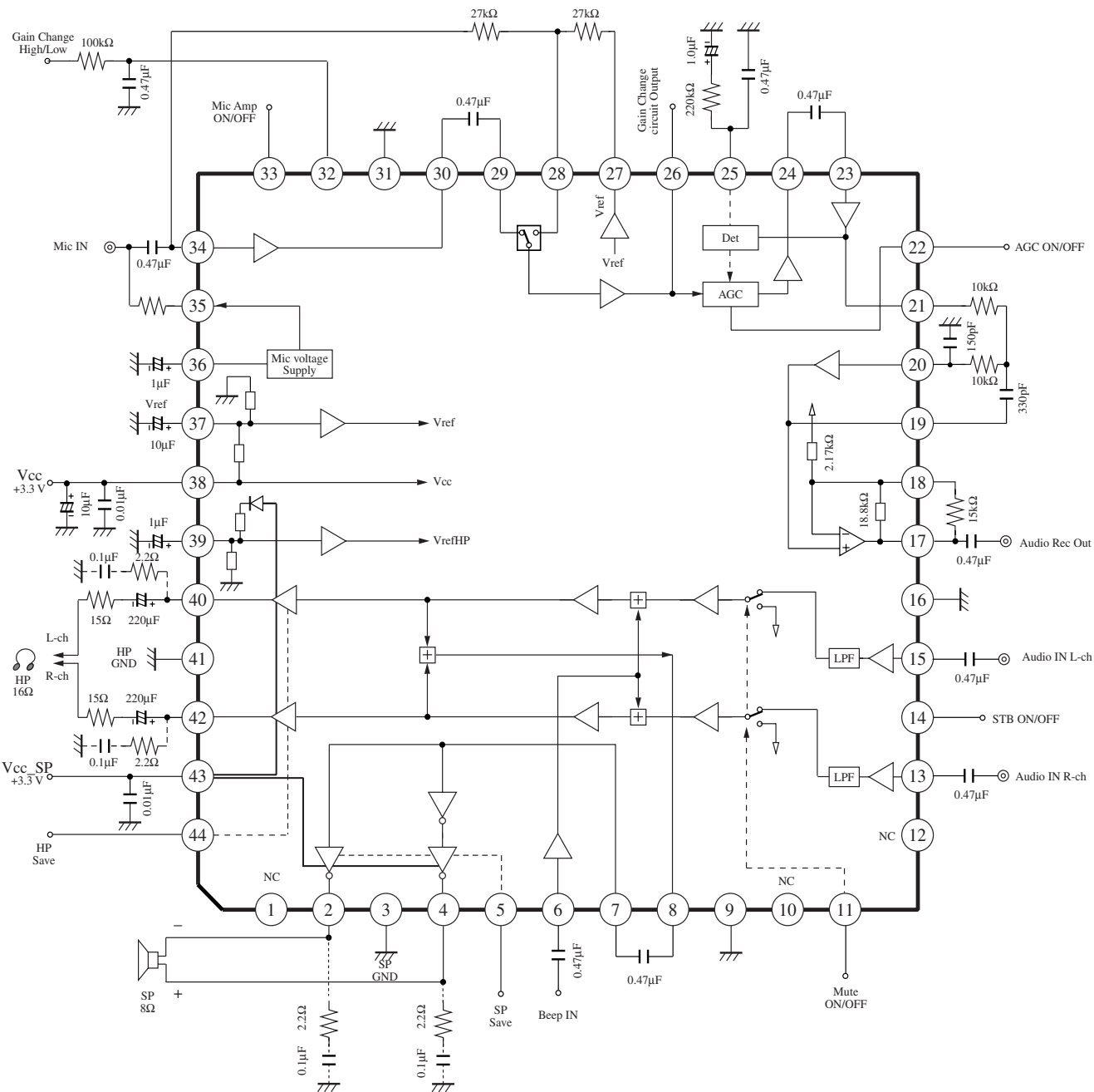
Applications Circuit



¶ The products and specifications are subject to change without any notice. Please ask for the latest product standards to guarantee the satisfaction of your product requirements.

Semiconductor Company, Matsushita Electric Industrial Co., Ltd.

■ Block Diagram



(Note) • Circuit constant show an example and don't guarantee design of set.

- The condenser and the resistor for the oscillation measure of Headphone output, speaker output is in need of install on the board.
- Please you make use to 20-pin and 21-pin are short, and 19-pin is open , if you don't use a low pass filter is made up 19-pin,20-pin and 21-pin.

■ Pin Description

Pin No.	Function	Pin No.	Function
1	N.C	23	OP Amp. input
2	SP output (-)	24	AGC Output
3	GND (for SP)	25	AGC demodulation pin
4	SP output (+)	26	Gain change circuit output
5	SP Power save SW	27	Gain change bias output
6	Beep input	28	Gain change Low-input
7	SP amp. input	29	Gain change High-input
8	MIX amp. output	30	MIC amp. output
9	GND	31	GND
10	N.C	32	Gain change SW
11	Mute ON/OFF SW	33	MIC amp. power save SW
12	N.C	34	MIC amp. input
13	Playback input R-ch	35	MIC supply
14	Standby SW	36	MIC supply filter
15	Playback input L-ch	37	1/2 V _{CC} (V _{REF})
16	GND	38	V _{CC}
17	REC output	39	1/2 V _{CC_SP} (V _{REF_SP})
18	Feedback pin for Rec-out amp.	40	HP output L-ch
19	LPF2 OP Amp. output	41	GND (for HP)
20	LPF2 OP Amp. input	42	HP output R-ch
21	OP Amp. output	43	V _{CC_SP} (for SP drive)
22	AGC ON/OFF SW	44	HP power save SW

■ Absolute Maximum Ratings

Parameters	Symbol	Rating	Unit	Note
Storage temperature	T _{stg}	-55 to +125	°C	1
Operating ambient temperature	T _{opr}	-20 to +70	°C	1
Supply voltage	V _{CC} /V _{CC_SP}	4.5	V	2
Supply current	I _{CC}	-	mA	
Power dissipation	P _D	194.2	mW	3

Note1) All items are at T_a = 25°C, except for the operating ambient temperature and storage temperature parameters.

Note2) The range under Absolute Maximum Ratings, Power dissipation.

Note3) Power dissipation shows the value of only package at Ta=70°C

■ Recommended Operating Range

Supply voltage	V _{CC}	2.7 V to 4.2 V	(Note 2)
	V _{CC_SP}	1.8 V to 4.2 V	

■ Electrical Characteristics at Ta = 25 °C ± 2 °C, V_{CC} = 3.0V , V_{CC_SP} = 2.5 V

Parameters	Symbol	Conditions	min	typ	max	Unit
Circuit current						
Circuit current without signal 1AH (V _{CC} -system, MIC Amp. ON)	I _{VCC} A1	V ₃₃ = 3 V , V ₅ = 0 V	4.3	6.3	8.3	mA
Circuit current without signal 2AH (V _{CC_SP} -system, MIC Amp. ON)	I _{VCC} A2	V ₃₃ = 3 V , V ₅ = 0 V	0.5	1.9	6.0	mA
Circuit current at SP,HP save mode 1B (V _{CC} -system, MIC Amp. ON)	I _{VCC} B1	Without signal V ₃₃ = 3 V , V ₅ = 0 V , V ₄₄ = 0 V	2.0	4.0	6.0	mA
Circuit current at SP,HP save mode 2B (V _{CC_SP} -system, MIC Amp. ON)	I _{VCC} B2	Without signal V ₃₃ = 3 V , V ₅ = 0 V , V ₄₄ = 0 V	–	0.1	0.5	mA
Circuit current at standby mode 1C (V _{CC} -system)	I _{VCC} C1	Without signal V ₁₄ = 0 V	–	10	20	μA
Circuit current at standby mode 2C (V _{CC_SP} -system)	I _{VCC} C2	Without signal V ₁₄ = 0 V	–	0.1	10	μA
Circuit current without signal 1DH (V _{CC} -system, MIC Amp. ON)	I _{VCC} D1	V ₃₃ = 0 V , V ₅ = 0 V	4.0	6.0	8.0	mA
Circuit current without signal 2DH (V _{CC_SP} -system, MIC Amp. OFF)	I _{VCC} D2	V ₃₃ = 0 V , V ₅ = 0 V	0.5	1.9	6.0	mA
Circuit current without signal 1ES (V _{CC} -system, MIC Amp. OFF)	I _{VCC} E1	V ₃₃ = 0 V , V ₄₄ = 0 V	3.0	5.0	7.0	mA
Circuit current without signal 2ES (V _{CC_SP} -system, MIC Amp. OFF)	I _{VCC} E2	V ₃₃ = 0 V , V ₄₄ = 0 V	1.0	5.0	8.0	mA
Circuit current at SP,HP save mode 1F (V _{CC} -system, MIC Amp. OFF)	I _{VCC} F1	Without signal V ₃₃ = 0 V , V ₅ = 0 V , V ₄₄ = 0 V	1.5	3.5	5.5	mA
Circuit current at SP,HP save mode 2F (V _{CC_SP} -system, MIC Amp. OFF)	I _{VCC} F2	Without signal V ₃₃ = 0 V , V ₅ = 0 V , V ₄₄ = 0 V	–	0.1	0.5	mA
Circuit current at V _{CC_SP} open mode 1G (V _{CC} -system, MIC Amp. ON)	I _{VCC} G	Without signal V ₃₃ = 3 V , V ₅ = 0 V , V ₄₄ = 0 V	2.6	4.6	6.6	mA
Circuit current at V _{CC_SP} open mode 1H (V _{CC} -system, MIC Amp. OFF)	I _{VCC} H	Without signal V ₃₃ = 0 V , V ₅ = 0 V , V ₄₄ = 0 V	2.0	4.0	6.0	mA
Circuit current at V _{CC_SP} open mode 1I (V _{CC} -system, Standby)	I _{VCC} I	Without signal V ₁₄ = 0 V	–	10	20	μA

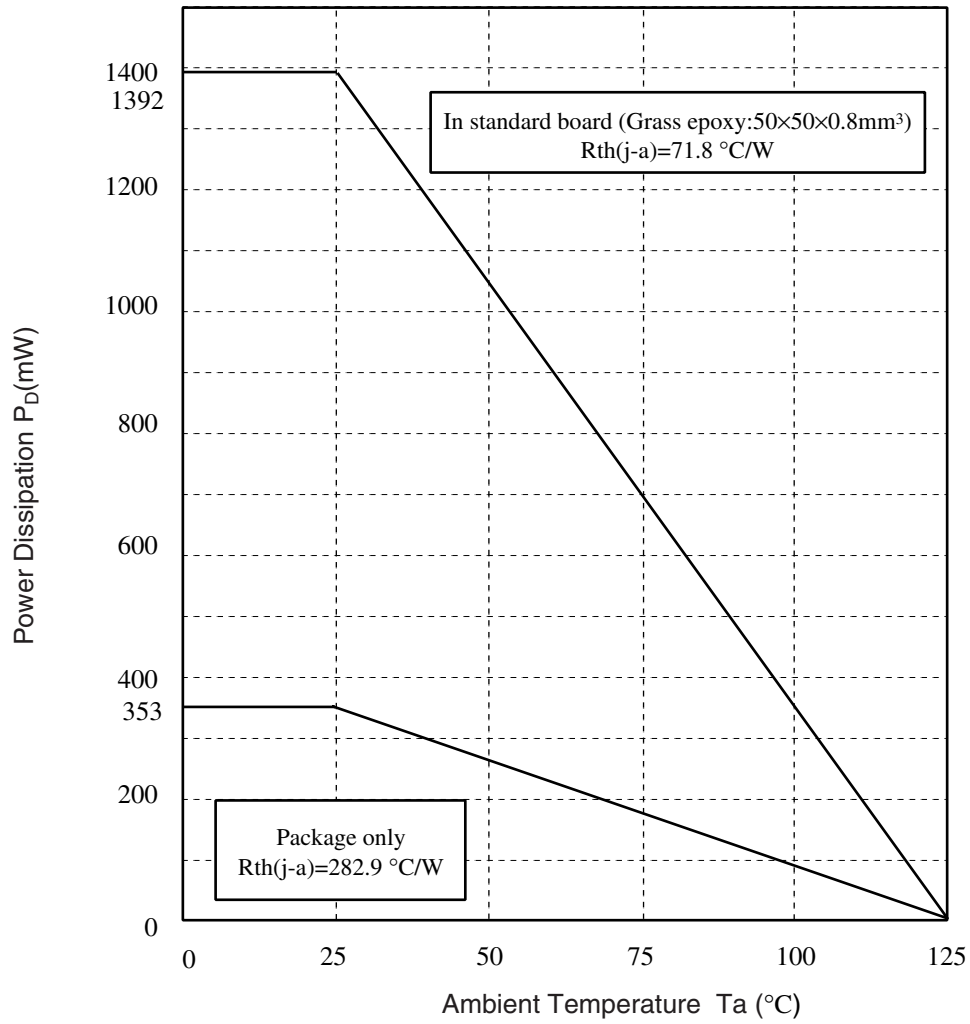
■ Electrical Characteristics at Ta = 25 °C ± 2 °C, V_{CC} = 3.0 V, V_{CC_SP} = 2.5 V

Parameters	Symbol	Conditions	min	typ	max	Unit
Power supply for microphone						
Microphone power supply	V _{MIC}	with output current -5 mA	1.8	2.0	2.2	V
Microphone amp. characteristics Microphone amp. input→ Microphone amp. output						
Output level	V _{ROM}	V _{in} = -37 dBS, 1 kHz	-21	-20	-19	dBS
Output distortion	TH _{ROM1}	V _{in} = -37 dBS, 1 kHz, up to 5 th THD	—	0.02	0.10	%
Output noise	N _{ROM}	Without input signal, using A-curve filter	—	-101	-97	dBS
Maximum input level	TH _{ROM2}	V _{in} = -27 dBS, 1 kHz, up to 5 th THD, load = 22 kΩ	—	0.02	1.0	%
Rec. AGC characteristics AGC input→Rec. output REF = -50 dBS						
Rec. output level A (REF -3dB)	V _{ROA}	V _{in} = -53 dBS, 1 kHz	-16.3	-15.3	-14.3	dBS
Rec. output distortion 1A (REF -3dB)	TH _{ROA}	V _{in} = -53 dBS, 1 kHz, up to 5 th THD	—	0.02	0.10	%
Rec. output noise voltage A	VN _{ROA}	With out input signal, using A-curve filter	—	-71	-67	dBS
Microphone AGC characteristics 1 (REF +3 dB)	V _{AGCML1}	V _{in} = -47 dBS, 1 kHz	-14	-12	-10	dBS
Microphone AGC characteristics 2 (REF +20dB)	V _{AGCML2}	V _{in} = -30 dBS, 1 kHz	-14	-11	-8	dBS
Microphone AGC characteristics 3 (REF +30 dB)	V _{AGCML3}	V _{in} = -20 dBS, 1 kHz	-14	-11	-8	dBS
Microphone AGC characteristics 4 (REF +40 dB)	V _{AGCM4}	V _{in} = -10 dBS, 1 kHz	-12.5	-9.5	-6.5	dBS
Microphone AGC characteristics 4 distortion(REF +40 dB)	TH _{AGCM4}	V _{in} = -10 dBS, 1 kHz up to 5 th THD, load = 22 kΩ	—	0.2	1.0	%
HP output characteristics at playback PB input→HP output						
HP Reference output level	V _{LOPS}	V _{in} = -28.3 dBS, 1 kHz, load = 31 Ω	-18.3	-16.3	-14.3	dBS
HP Reference output distortion	TH _{LOPS}	V _{in} = -28.3 dBS, 1 kHz, up to 5 th THD load = 31 Ω	—	0.10	0.50	%
HP Reference output noise	VN _{OPS}	Without input signal, using A-curve filter load = 31 Ω	—	-87	-82	dBS
HP Maximum output level	V _{LMAPOS}	f = 1 kHz, load = 31 Ω input level THD = 1 % (up to 5 th)	-3.5	-1.5	—	dBS
Output noise at HP mute mode	V _{LMUPOS}	Without input signal, using A-curve filter load = 31 Ω, V _{I1} =0 V	—	-89	-84	dBS
PB maximum output level	V _{LMAPIs}	f = 1 kHz, load = 31 Ω input level THD = 1 % (up to 5 th)	-15.5	-13.5	—	dBS
Output level at power save mode	V _{PHPPS}	V _{in} = -28.3 dBS, 1 kHz, Using A-curve filter, load = 31 Ω	—	-111	-110	dBS
Beep output level	V _{HPBEP}	V _{in} =2.7 dBS, 1 kHz, load = 31 Ω	-18.3	-16.3	-14.3	dBS

■ Electrical Characteristics at Ta = 25 °C ± 2 °C, V_{CC} = 3.0 V, V_{CC_SP} = 2.5 V

Parameters	Symbol	Conditions	min	typ	max	Unit
SP output characteristics						
SP reference output level at playback	V _{SPPS}	V _{in} = -28.3 dBS, 1 kHz load = 8 Ω,	-3.3	-1.3	+0.7	dBS
SP reference output distortion at playback	TH _{SPPS}	V _{in} = -28.3 dBS, 1 kHz load = 8 Ω, up to 5 th THD	—	0.2	0.9	%
SP reference output noise at playback	VN _{SPPS}	Without input signal, using A-curve filter load = 8 Ω	—	-76	-71	dBS
SP output noise at mute and playback	V _{SMUPOS}	Without input signal, using A-curve filter V _{I1} = 0 V, load = 8 Ω	—	-78	-73	dBS
SP maximum rating output at playback	V _{MSPPS}	f = 1 kHz R _{OUT} = 8 Ω, THD = 10 %	200	270	—	mW
SP output at power save and playback	V _{PSPPS}	V _{in} = -28.3 dBS, 1 kHz Using A-curve filter, load = 8 Ω	—	-111	-100	dBS
SP: beep output level at playback	V _{SPBEP}	V _{in} = -2.7 dBS, 1 kHz load = 8 Ω	-3.3	-1.3	+0.7	dBS
Mode selection hold voltage						
MIC amp. off hold voltage range	V _{33L}	—	0	—	0.5	V
MIC amp. on hold voltage range	V _{33H}	—	2.5	—	3.0	V
MIC amp. ON/OFF pin open voltage	V _{33MIC}	V _{CC} = 3.0 V, 33-pin open	0.0	0.05	0.5	V
Gain low hold voltage range	V _{32L}	—	0	—	0.5	V
Gain high hold voltage range	V _{32H}	—	2.5	—	3.0	V
AGC off hold voltage range	V _{22L}	—	0	—	0.5	V
AGC on hold voltage range	V _{22H}	—	2.5	—	3.0	V
Standby on hold voltage range	V _{14L}	—	0	—	0.5	V
Standby off hold voltage range	V _{14H}	—	2.5	—	3.0	V
SP output off hold voltage range	V _{5L}	—	0	—	0.5	V
SP output on hold voltage range	V _{5H}	—	2.5	—	3.0	V
HP output off hold voltage range	V _{44L}	—	0	—	0.5	V
HP output on hold voltage range	V _{44H}	—	2.5	—	3.0	V
Mute on hold voltage range	V _{11L}	—	0	—	0.5	V
Mute off hold voltage range	V _{11H}	—	2.5	—	3.0	V

■ Package Power Dissipation



Request for your special attention and precautions in using the technical information and semiconductors described in this material

- (1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.
- (2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.
- (3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
 - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
 - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.
- (6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.
- (7) No part of this material may be reprinted or reproduced by any means without written permission from our company.

Please read the following notes before using the datasheets

- A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.
- B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.
- C. These materials are solely intended for a customer's individual use.
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.